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BY HIS MAJESTY'S ROYAL LETTERS PATENT.

THE ART

OF

PRESERVING AND DEFENDING

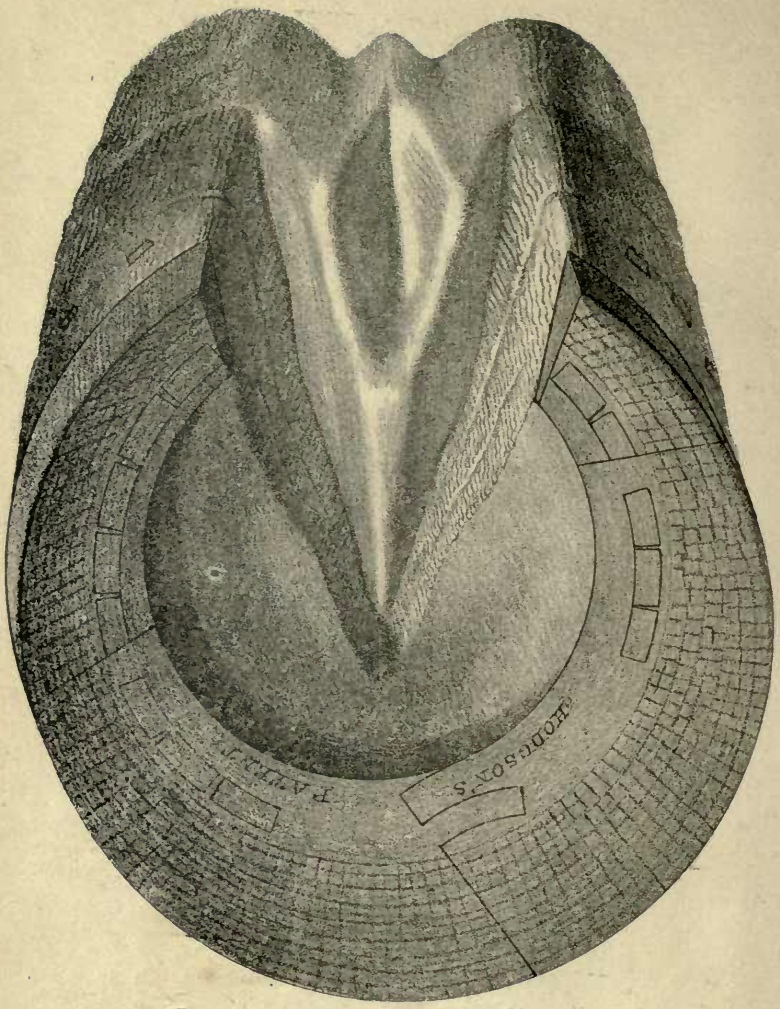
THE

FOOT OF THE HORSE.

The Author having obtained a Patent for the invention described in this Work, the use of it is precluded. But it being the Patentee's wish to lay the invention open to the public, as far as is consistent with his interest, the possessors of this Work are entitled to practise it, excepting always the imitation of Models, Defences and Nails, described in the Work, and such improvements as the Patentee may make thereon, till the time of the Specification of his Patent; and of which due notice will be given.

London,
November 1824.

Orders received for Models of Hoofs, Defences, and Nails, at 36, King Street, Soho.



J. V. Hodgson del. J. Scharf lithog.

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THE ART

OF

PRESERVING AND DEFENDING

THE

FOOT OF THE HORSE;

DEDUCED MATHEMATICALLY

FROM

THE STRUCTURE AND FUNCTION OF THE HOOF:

AND

OBSERVATIONS ON THE DIFFERENT STATES OF HORSES' FEET, WITHOUT AND UNDER VARIOUS ARTIFICIAL DEFENCES.

By JOHN THOMAS HODGSON,

MEMBER OF THE VETERINARY COLLEGE, &C.

LONDON:

PRINTED FOR THE AUTHOR,

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AND BY ALL BOOKSELLERS.

1824.

"Before any science or art can make great progress, it is requisite that every member of it be furnished with a synopsis of the fundamental principles of that science or art."—PERCIVALL.

"The sciences are not human inventions. Every science has for its basis a system of principles, as fixed and unalterable as those by which the universe is regulated and governed. Man cannot make principles; he can only discover them."

PRINTED BY RICHARD TAYLOR,
SHOE-LANE.

TO

THE PRESIDENT, VICE-PRESIDENTS,

AND

COMMITTEE OF GOVERNORS

OF

THE VETERINARY COLLEGE,

THE ART OF

PRESERVING AND DEFENDING

THE FOOT OF THE HORSE,

IS MOST RESPECTFULLY SUBMITTED

BY

THEIR OBLIGED AND DEVOTED SERVANT,

THE AUTHOR.

PREFACE.

IN 1808 I became the pupil of Mr. H. J. Coward, Veterinarian of His Majesty's Ordnance, whom I accompanied on Sir John Moore's expedition to the Peninsula.

On my return to England in 1809, I continued my studies in an extensive practice under that gentleman; and to those who know him professionally I need not mention the advantages I derived from the kind interest taken in my instruction, till I went to the Veterinary College in 1813, but which I have now the pleasure to acknowledge.

In 1815 I went to India, where, from the circumstances in which I was placed, I had extensive opportunities for veterinary inquiry, and particularly on the subject of the present work.

For five years I held a situation at the Hissar Establishment (district Hurriana, province Dehli) for the Improvement of the Breeds of Horses, Camels, and Neat Cattle, and the purchase of these animals for the use of the army.

In March 1821 I became Veterinarian to the Governor-General's Body Guard, which imposed on me the duty of teaching the principles and practice of shoeing horses, the most important branch of the Veterinary Art; and I endeavoured to remedy its imperfections. In reflecting on observations of the different states of the feet of many thousands of horses, of all ages, and under

different circumstances, it occurred to me that the hoof, however varied the form in individuals, had a determinate proportion and action, from which rules could be deduced mathematically to systematize the art of preserving and defending the foot of the horse.

Mr. Percivall, in his Lectures on the Veterinary Art, writes—"Why should we still adhere to the same principles in our practice of shoeing, when so many said to be new and valuable systems are offered to our notice at this day? . . . . Many of the improvements in shoeing have been received with as much fervor for their promotion as ever neurotomy was; but few have borne even the test of argument, and much fewer that of experiment."

Whatever the principles alluded to, I

would ask, What gave rise to these systems, but that something was still required? and if not, why the fervour for their promotion? How far this has been supplied in the late modifications in the practice, and what is still wanted, will be proved in the course of this work, in which I have been unavoidably led to propose strictures on opinions and practices; but I trust the manner has been with due regard to the feelings of those from whose researches on this subject I have derived assistance *.

I lay claim to no further originality than to the mode of determining the practice of principles discovered by others, and for which I have obtained a Patent. However, the possessors of this work are at liberty to practise the invention, excepting the imita-

* The modern writers are Messrs. Coleman, Moorcroft, Bracy Clark, Goodwin, Budd, and Powis.

tion of models, defences and nails, described in the work.

To the scientific reader I must apologize for the mathematical elucidations, the object being to render this system intelligible to those deputed to the management of horses, and the workmen who practise this art.

I cannot conclude without offering my grateful acknowledgements to those friends who, by their kindness in promoting my interests, have also forwarded my views on this subject.

CONTENTS.

THE ART

OF

PRESERVING AND DEFENDING

THE

FOOT OF THE HORSE.

ON THE HOOF.

STRUCTURE OF THE HOOF.

THE structure of the hoof is composed of different kinds of horn, and several parts have obtained distinctive appellations; as, the Crust or convex surface, and the Bars, which are the inflections of the crust inwards at the posterior part of the hoof, blended with the horn of the sole or inclined arch, and forming a triangular space for the frog or inverted arch: these, and the lowermost part of the crust, form the inferior surface of the hoof. The coronary frogband is the horn

that extends from the bulbous portion of the frog all round the uppermost part of the crust, within which is the coronary concavity; and below this, the great cavity of the hoof, lined on the interior of the crust with laminæ. *Pl.* I. VII.

The several parts of the hoof are intimately blended, and are with difficulty separated by maceration, which has caused different opinions as to the continuation of several parts. It has been stated, that the crust is not inflected further than opposite the inflected laminæ; but the crust extends below the laminæ, at this, as at other parts of the hoof; besides, this is immediately seen, on examination of a hoof in the natural state, when the bars extend beyond the point of the frog *.

FORM OF THE HOOF.

The convex surface of the hoof is cylindrical

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* Those desirous of obtaining more particular information regarding the structure of the hoof, will find it by referring to a series of Original Experiments on the Foot of the Living Horse, exhibiting the changes produced by Shoeing and the causes of the apparent mystery of this art; by Bracy Clark, &c.

with a mixture of the cone; the inclination however, to the latter form, is scarcely perceptible in the foal; the depth of the hoof on the outer and inner part of the front being less than the diameter of the circumference of the upper part of the hoof, the measure of which is greater than that of the lowermost part of the crust, from the point of one inflection, or horny heel, to the other: and this is sometimes the case in the adult. But the substance of horn that forms the cone generally increases with the growth of the animal, and in a well-formed hoof is apparent from about midway from the coronet to the lowermost part of the crust, and is of greatest substance on the outer part of the front only, or on the inner part also, sometimes on the inner part only; in either case the substance gradually diminishes towards the posterior part, and ceases where the hoof becomes cylindrical.

The disposition and substance of horn that forms the cone is dependent on the original conformation of the animal, in regard to weight and the structure of the extremities; and the consequent

action and position influencing the degree of weight, and the distribution of it on particular parts of the hoof: thus more weight is thrown on the hoofs of a heavy than of a light animal, and on the fore than hind hoofs; for the fore hoofs support the head, neck, anterior extremities, and most of the body; while the hind hoofs support the posterior extremities, and comparatively little of the body, except in the paces of progression, when the posterior extremities more particularly form the levers to propel the body forwards. As the action of the animal is high or low, *i. e.* as there is more or less flexion or extension of the extremities, the hoofs in the first are oftener brought to the ground than in the last action, and the weight oftener thrown on the hoofs. Besides, as the angles of the joints are obtuse or acute, and the consequent position of the bones perpendicular or oblique, the weight in the former will be thrown more on the anterior, in the latter on the posterior part of the hoof: and thus are produced the various forms of hoofs in individuals in the same variety, of different ages;

and the characteristic forms in varieties of the species of the horse genus and mules. The substance of horn is disposed differently at particular parts of the hoof, at the front to meet the demand of wear, which is less at the posterior part, where it is disposed to support the weight when brought to the ground. *Pl.* II. VII. VIII.

ACTION OF THE HOOF.

The action of the hoof takes place by the descent of the sole, which becomes flattened most at the centre, near the point of the frog, and causes the horn of the bars and sole opposite to form levers to force the crust, where it is cylindrical, downwards and outwards. When the coneform is on the outer part of the front only, the action is greater on the inner part of the hoof; and *vice versa* when the coneform is on the inner part of the front only; but when the coneform is on the outer and inner part of the front, the action is alike on the inner and outer parts of the hoof.

Where the hoof is most cylindrical there is most action, which gradually decreases, and ceases where there is most substance of horn forming the cone, which is produced by the edge of the sole opposite abutting against the crust, the substance of which gradually increases as the action of the hoof decreases. *Pl.* II. VII. VIII.

BEARING OF THE HOOF.

In the natural paces of progression, the hoof bears flat on the ground, and the lowermost part of the crust, where it is conical, first bears. The inferior surface of the hoof is more or less concave, which, and the lowermost part of the crust where it is cylindrical, does not bear till the action of the hoof takes place, which is almost simultaneously with the landing of the hoof, and the extent of bearing is then according to the degree of this action, that brings these parts to bear, and as the nature of the ground admits more or less of the inferior surface of the hoof to come in contact. *Pl.* I. II. III. VII. VIII.

FUNCTION OF THE HOOF.

The function of the hoof is to support the weight of the animal by the connexion of the laminæ of the crust with those of the sensible parts of the foot, which it defends from injury, not only by forming an insensible covering, but by the expansive and elastic nature of the horn and the relative proportion of the several parts allowing of the action of the hoof, and of the elongation of the laminæ of the crust inwards and downwards, by which the weight is distributed over the inferior surface of the hoof, and concussion is prevented.

GEOMETRICAL PROPORTION OF THE HOOF.

The hoof, like other parts of the horse, has a determinate proportion, which it is necessary to consider, in order to ascertain the deviations that are less perfect, and the state of the hoof in the living horse, to prevent alteration of the original form, whatever it is.

The inclination of the anterior and posterior parts of the convex surface of the hoof is 33 degrees from the perpendicular. The depth of the hoof at the outer and inner part of the front, taken from the upper part of the hoof at the distance of one-fourth of the circumference, to the lowermost part of the crust at the distance of one-third, should measure equal to the diameter of the circumference of the upper part of the hoof; and at the posterior part, or inflections, equal to the semi-diameter. The lowermost part of the crust should measure, from the point of one inflection to the other, equal to the circumference of the upper part of the hoof. The space between the inflections is increased according to the degree of action of the hoof; before which takes place, it should measure one-sixth of the circumference of the upper part of the hoof. This proportion depends on the substance of the coneform,—difference in which, and the disposition at a particular part of the front, constitute the only natural varieties in the forms of hoofs. *Pl.* II. VII. VIII.

GROWTH OF THE HOOF.

The horn is always being secreted, but the quantity is more or less, as the temperature of the climate is hot or cold, dry or moist, and as the evaporation of moisture from the horn, or application of moisture from without, renders the horn harder or softer, to admit of more or less dilatation of the extremities of the secretory vessels, and as the circulation of the blood in the foot is increased by the action of the horse.

CONSUMPTION OF THE HOOF.

The separation, breaking, and wearing of the inferior surface of the hoof, is dependent on the remote cause of conformation of the animal, as to weight, action, and position of the extremities; and the occasional causes of climate, as to temperature, arid or moist; the nature of the ground, hard or soft, smooth or irregular; the carrying or drawing of weight, and the rate and continuance of progression.

DIFFERENT STATES OF HORSES' FEET WITHOUT DEFENCES.

Under favourable circumstances in regard to the remote and occasional causes, the consumption of the horn is taking place generally at the inferior surface of the hoof; the exuberant horn of the sole separates, and the lowermost part of the crust breaks or wears; and as the substance of horn is re-produced, the proportion of the hoof and the relative position of the foot with the leg are preserved, and the action of the extremity is not opposed. But this is not the case when the consumption of horn takes place at particular parts of the inferior surface of the hoof.

When the hoof is destroyed at the anterior part, the inferior surface becomes more circular, and the posterior part, where cylindrical, bears immediately on the ground, and supports more of the superincumbent weight; and the horn, already inclined inwards, is pressed still further in this direction; and when this is sudden, the horn

cracks from the coronet downwards; and as the action of the hoof and the elongation of the laminæ is prevented, the inferior surface becomes more concave and of greater substance. When the lowermost part of the crust at the front is worn, it does not bear, and the outer and inner of the front then support more weight, and the horn cracks in front from the lowermost part upwards. These states of the hoof form what is commonly called "Contraction, Sandcrack, Thick Sole, Cloven Hoof."

When the hoof is destroyed at the posterior part, the inferior surface becomes more oblong, and the anterior part supports more of the weight from above. The laminæ are incapable of supporting the weight in this manner, and are put on the stretch, and the weight is conveyed to the inferior surface, the horn of which separates and becomes of less substance and more circular, and the crust more conical, uneven, flattened or incurvated in front or laterally. These states of the hoof form "Flat, Convex, Ribbed, Incurvated or Foundered Hoofs," &c.

A hot and arid climate renders the horn hard; when it is less liable to deformity and destruction than in temperate and cold climates, where the horn is soft: but whether the climate is hot or cold, if it is moist, the hoof by exposure to moisture becomes softer, and is less capable of supporting the superincumbent weight, and the crust becomes deformed, or the substance of horn at the lower surface of the hoof is sooner destroyed.

The action of the hoof cannot take place so readily on hard as on soft ground, whether smooth or irregular, nor when the animal is carrying as when drawing weight, nor at a quick as at a slow rate of progression: and in proportion to the resistance to this action, so is the concussion. These cause deformity and destruction of the hoof, according to the degree and continuance, and frequently inflammation of the foot, called "Groggy, Founder," &c.

When the action of the hoof is prevented, the inflection of the crust or centre of the arch, near the point of the frog, becomes fixed points, on which the sensible parts of the foot opposite are

bruised, and the blood is extravasated, and produces discoloration of the horn, called a "Corn;" which never happens, however thick the horn of the sole, while this action is not prevented. Similar effects arise at any part, when, from destruction of horn, the sensible parts are imperfectly defended. The injury, in either case, may be to such degree as to produce inflammation and suppuration, when, if the horn is not entirely removed, the pus makes its way out at the coronet, forming the disease called "Quittor." But if the injury to the sensible parts of the foot is such only as to increase in a moderate degree the circulation of the blood in the foot, the secretion opposite the cleft of the horny frog is increased, and altered in quality, which destroys the horn of the frog, and forms a "Thrush." When the sensible parts are exposed at any part, and horn is not reproduced, but fungus is formed, the disease is called "Canker."

If the relative position of the foot and leg is not preserved, the leg is sometimes cut by the opposite hoof while in action, and more weight

is also thrown on particular parts of the extremity, which, and concussion, causes the diseases called "Splints, Spavins, Ringbones, Sprain or Clap of the Back Sinews, Curbs," &c.

The consideration of the remote and occasional causes fully explains why varieties of the species are more or less subject to particular states of the feet.

DIFFERENT STATES OF HORSES' FEET UNDER VARIOUS ARTIFICIAL DEFENCES.

To obtain the labour required of the horse in the domesticated state, it is necessary to counteract the remote and occasional causes of consumption of horn, and the consequent states of the feet, by applying an artificial defence.

The practice of applying iron, as a defence to the hoof, it appears was first adopted in Asia*. In Asia and the bordering countries of Europe, a thin plate of iron is used, the various shapes of

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* *Essay on the Origin of Modern Shoeing*, by Bracy Clark. &c.

which would seem in a great measure to be dependent upon the following circumstances: The plate once made, admits, from the thinness, of considerable alteration in form, by being hammered when cold; and it is therefore readily fitted, not only to different sizes, but to particular states of the hoof.

It is the practice in all these countries to leave great substance of hoof, only paring away sufficient horn to get a parallel bearing on the plate, there being in this case no necessity for changing this form; but when the hoof is worn or broken away at the toe or heels, instead of paring the hoof to get a parallel bearing, the plate is adapted to the hoof, which would appear to be the origin of the curve in the plate, and the curve is increased accordingly, as there is less substance of horn.

A greater surface of bearing of the hoof on the shoe is obtained by this adaptation to the state of the hoof, than by paring away more of the substance of horn to get a parallel bearing, which would consequently be still more diminished; and practice having shown that when there is little

substance of horn, extensive bearing of the hoof on the shoe produces lameness, the plate is made concave next the hoof, and convex next the ground, the thinness not admitting of its being made flat: and this would appear also to have determined the width of the web, to give more or less cover to the sole, and sometimes to the frog, by making the plate a complete ring. In other cases the greater portion of the sole and the whole of the frog is unprotected by the plate. Whatever the form of the plate, the nail holes, whether circular, oblong, or square, are large, which admits of liberty in the direction of driving the nails, according as the substance of the hoof allows of taking greater or less hold; and of driving the nails obliquely, outwards, or upwards, so that the nail comes out low down, or high up on the outside the hoof. With the same view the shank of the nail sometimes proceeds from the side of the head, by turning which either way, more or less hold can be taken without the head projecting over the outer edge of the shoe.

But whether the plate of iron is a parallel

plane or convexo-concave, if not turned down, the bearing on the ground is not affected in the same degree; for in these methods, the heads of the nails being large project below the lower surface of the plate,—and when it is not turned down, are first taking bearing, and being placed along the sides of the hoof, the toe and heels are not immediately bearing on hard ground, the segment of a circle being described by the bearing, as action is completed. When the defence is adapted to the state of the hoof, the bearing surface on the ground is greater, becoming, unless turned down, more oblong; and a still greater bearing is sometimes obtained by making the plate extend beyond the circumference of the hoof in front, which practice is common in some countries, not only in shoeing horses, but almost always in shoeing mules and asses. The projection is sometimes several inches; but this does not form a lever to force off the shoe, as it is counterbalanced by a similar projection posteriorly; and is sometimes turned down, which reduces the bearing surface on the ground.

In those countries where, from remote and occasional causes, a thin plate would be soon destroyed, greater substance of iron is requisite, as well as more attention to the security of its attachment to the hoof, by making the nail-holes smaller. The nail-head instead of projecting below the surface of the plate is altered in form, and disposed in a groove called the *fuller*, or in a counter-sunk hole. This alteration in the size of the nail-hole makes it necessary to punch the hole nearer the outer rim when the plate is made convexo-concave, that the nails may be driven with safety; and this practice has been carried furthest in England*, where the skill of the workman is displayed the nearer the fuller is made to the outer edge of the shoe: but this—

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* "With William the Conqueror, the art of shoeing appears to have come into England: he gave to Simon St. Liz, a Norman, the town of Northampton and the hundred of Falkley, then valued at 40*l.* per annum, to provide shoes for his horses; and Henry De Ferrers, who also came with him, he appointed as superintendant of the shoers, whose descendants, the Earls of Ferrers, had six horse-shoes in the quartering of their arms. At Oakham, in Rutlandshire, the

though it is necesssary when the substance of the hoof is reduced so as to require this alteration in the form of the plate—is not so when there is sufficient substance of horn to admit of a parallel plate. The insecurity, too, of this mode of nailing is evident by the more frequent loss of shoes, where the practice is carried to the extreme.

The leading circumstances in these practices of shoeing, appear to have been influenced by the substance of horn; and the same causes that destroyed this, also rendered the alteration in the plate and mode of nailing necessary; and any practice once begun would be continued, from custom, when the necessity that caused the original adoption had ceased; and in this way the

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seat of this family, a singular and rather tyrannical custom long prevailed: If any baron of the realm passed through the place, for him to forfeit one of his horse's shoes, unless he chose to redeem it by a fine; and the forfeited shoe, or the one made in its place, was fixed upon the castle gates, inscribed with his name: in consequence of this custom the castle gates became in time covered with numerous shoes, some of them of unusual size, and others gilt, &c."—B. Clark.

differences in the practices of various countries may be accounted for.

With improvement in the Veterinary Art, the knowledge of the structure and function of the foot became known: and with reference to these, various modifications were introduced into the practice of shoeing horses.

In regard to the bearing of the hoof on the long shoe, Mr. Coleman laid it down as principles, that "the shoe should invariably rest on the crust, and never touch the sole." But as the shoe had not the expansive and elastic property of horn, it became necessary to remove a portion of the sole, the substance of which was therefore sacrificed to prevent the sole bearing on the shoe, and the consequent pressure to sensible parts opposed to it by the action of the hoof. But Mr. Coleman, in his Lectures, says, "The anterior or part of the sole at the toe may be pressed upon with impunity, as it is not opposed to any sensible part: the shoe should therefore be placed upon it, as it strengthens the attachment." The former, therefore, are not the true principles of

defending the hoof, to admit of such deviation. Besides, it has been proved that the same holds good at the quarters and heels, while the proportion of the hoof is preserved; and the defence can act with the hoof*; and even bearing over the whole inferior surface of the hoof, though opposed to sensible parts, as shown in horses going without defences.

The long shoe prevents the action of the hoof, which is seen on removing a shoe that has been on but a short time; not only from the destruction of the horn from concussion, but the polished surface of the shoe, which proves that the action of the hoof opposite is resisted, and to the greatest degree, by the inclined plane inwards, or the concave surface next the hoof; not so much in the parallel plane or flat surface next the hoof; less in the inclined plane outwards, or convex surface next the hoof, which resists the action of the hoof downwards only, but not outwards: and

* This was practised by the author for two years, on the roads of Calcutta which are Macadamized with bricks.

still less by tips not let in at the front of the hoof; and when the hoof, where it is cylindrical, is not bearing on the shoe, whether or not the frog is resting on the shoe, as in Bar shoes, and Mr. Coleman's Patent Frog shoes. Whatever the surfaces next the hoof of shoes, in several pieces, with one or more joints, moving on a rivet, or attached in any other way, the action is not similar to that of the hoof. The comparative benefit from the application of any of these shoes, arises from the action of the hoof not being so much prevented; and not from the hoof having a more general bearing on the shoe, or greater bearing surface on the ground, or pressure to the frog.

Much difference of opinion has existed in regard to pressure on the frog, which was never laid down as a principle: for Mr. Coleman always asserted that, whatever the distance of the frog from the ground, the relative position of the leg with the foot (which can only be preserved by reference to the proportion of the hoof) was not to be disturbed, to bring it

to pressure, and the patent frog was proposed to be used: but as pressure on the frog only acts on the newly formed horn at the coronet, while the action of the hoof is prevented the frog has lateral pressure, and remains small; but when this can take place, the frog expands laterally, and is opposed to pressure from the ground, which increases the size and the expansive and elastic property of the frog necessary to the action of the hoof.

The action of the hoof is prevented by nails, more or less, according to the part of the hoof in which they are applied. The hoof being fixed at one part, is nearly as injurious as at another, and there must be strain on the nails or clinches in any mode of nailing, when the shoe and nails cannot act with the hoof; and the nails therefore are bent in proportion to the action of the hoof.

With respect to the bearing surfaces of shoes on the ground.—When the proportion of the hoof is preserved, the coffin bone is bearing on an inclined convexity; therefore the argument drawn from the shape, when bearing on a level surface,

in favour of giving the same shape to the shoe, falls to the ground. When the shoe is curved upwards in front, to give what is called the *adjusture*, the bearing on the ground is the same as that of a worn hoof. The curve at the heels, when the proportion of the hoof is preserved, accords with that of the lowermost part of the crust, where it is cylindrical, before the action of the hoof has taken place, but not when it bears on the ground: and as the curved part cannot descend, the weight is thrown on the springs of the leg, which is, more or less, the case in all methods of shoeing, where the hoof is defective in proportion, and the iron substituted is not with reference to this and the action of the hoof.

ART OF PRESERVING THE HOOF.

To preserve the hoof, it is necessary to consider the remote and occasional causes of consumption of horn. Horses should be applied to the purposes to which, from their conformation, they are best adapted. Heavy horses should be used

only in slow draught, and light horses in quick work, either in carrying or drawing weight.

The expansive and elastic property of the horn is to be preserved by the application of moisture, or tallow, wax, tar, resin, or pitch, either alone or mixed, according to circumstances, to prevent the evaporation of moisture from the horn, or the effect of moisture from without; and the application should be of such consistence as is most capable of resisting the occasional degree of heat or moisture for the time required. When ointment, however, is frequently applied, a crumbly state of the horn is apt to be induced, which must be prevented by restricting the use of ointment, and by keeping the hoof dry or moist, as the case may require the horn to be rendered harder or softer.

Should the hoof require paring, take the geometrical proportion with a strip of sheet lead, and pare the lowermost part of the crust parallel, opposite where it is conical, and from this curved gradually, opposite where it is cylindrical, to the posterior part; and the sole and lowermost part

of the bars moderately concave; then round off the sharp edge of the crust, and cut away parts of the frog that may be nearly detached. The hoof is not to be pared with the view to change the faulty position of the leg, that the opposite hoof may not cut the leg or hoof, called "Cutting, Speedy Cut, Overreach," which is best prevented by preserving the proportion of the hoof.

ARTIFICIAL DEFENCE OF THE HOOF.

When, from remote and occasional causes, the proportion of the hoof cannot be preserved without, an artificial defence must be applied. The principles of artificially defending the hoof, are to remove a portion of the horn, and to substitute a substance of the same form, more durable, yet possessing the expansive and elastic property of horn:—and it becomes a question how far art is capable of this. The first and second objects are readily obtainable in iron, which can be applied to act with the hoof in a certain degree, or so as not wholly to restrain the action of the hoof, that the inferior surface of the de-

fence may bear on the ground, in the same manner nearly as the natural hoof.

The geometrical proportion and action of the hoof must be considered, to determine the substance of horn to be removed, and the construction of the defence. Take the slant height, at an inclination of 33 degrees from the perpendicular, of one-twelfth the diameter of the circumference of the upper part of the hoof; this shows the substance of horn to be removed at the front of the hoof, the depth of which, on the outer and inner part of the front, is then equal to the depth of the hoof directly in front, half which, shows the depth of the hoof at the posterior part, opposite the inflections of the crust, when pared to receive the defence. *Pl.* I. II.

On seven twenty-fourths of the diameter anterior to the point of the frog, draw the segment of a circle, on the inferior surface of the hoof, from a point distant one-twelfth the diameter, posterior to the point of the frog, without which segment the inferior surface is to be pared parallel, and within it moderately concave.

GEOMETRICAL CONSTRUCTION OF THE DEFENCE.

From points (1, 2) distant one-twelfth the diameter of the circumference of the upper part of the hoof, draw, opposite each other, two semicircles (a, b) of the circumference, and join the segments to form an oval. From a point, one-third of one-twelfth of the diameter posterior to point 1. draw another semicircle (c) of the circumference. The segment of a circle drawn from a point, the same distance anterior to point 1. and without semicircle a, would show the inferior circumference of the hoof (d); this substance being removed from the front of the defence, as iron would not break off like horn, but form a lever to force off the defence. On seven twenty-fourths distant from point 1, draw a circle (e) from point 2, which shows the bearing surface of the hoof on the defence, and the inside of the nail-hole. From a point (5) one-third of one-twelfth posterior to point 2, draw a circle (f), which with semicircles a, b, shows the surface of the defence next the hoof, and with a, b, c, that next

the ground. The substance added on the inside of circle (e) is equal to that removed from the front, and is for the purpose only of forming the joints and nail-head holes sufficiently distant from wear, and not as a cover to the sole, which is not required. On thirteen forty-eighths of the diameter distant from point 1, draw from point 2. a circle (g), which divide into twenty-four equal parts; (h) one part shows the length of the countersunk nail-head hole, the breadth of which is half this measure; (i), which is also the length of the nail-shank hole, the breadth being one-fourth the length (j) on the lower surface, and one half on the upper surface of the defence (k). These give the substance of a nail for a defence a size larger. The joints are made by forming a slide movement on each side the pieces of the defence, which extend over each other the sector of a circle drawn from a point at the outer circumference. The segment of the circle at the joint nearly opposite where the hoof becomes cylindrical, is one-twelfth the diameter. The segment of the circle at the front

joint is two-twelfths the diameter, within which is a segment of a smaller circle, one twenty-fourth distant from the first, and another still smaller, the same distance from the second. The segments of the sector lie over and support each other in contrary directions, half the thickness of the defence.

The action of the hoof is more or less prevented, as the nails are placed nearer to or further from the front joint, or side joints when the defence is constructed with side joints only; or without joints, with the cylindrical part turned downwards and outwards. *Pl.* IV. V. VII. VIII.

APPLICATION OF THE DEFENCE.

When the coneform of the hoof is on the outer or inner part of the front only, the widest part of the defence is to be placed opposite the coneform; but directly in front, when the coneform is on the outer and inner part also. The superfluous part of the defence is then to be cut off in the direction of the inflections of the crust. *Pl.* VII. VIII.

The manner of driving the nails is obliquely outwards; so as to appear, on the convex surface, in a line, where the horn is to be removed for the next defence. The sharp point of the nail is to be twisted off, and the remainder of the shank turned round and flattened, so as to form a large clinch. A nail or two on the inner quarter of the hoof, and at any other part when the large clinch is broken off by accident, should be clinched in the ordinary manner. The large clinch is more likely to prevent the loss of the defence; should which happen, care must be taken that the hoof may not be broken.

Should the coneform project over the defence, it is to be removed. When the coneform is deficient in substance, the defence will project in proportion beyond the circumference of the inferior surface of the hoof.

When the growth of horn is sufficient to get a fresh attachment for the defence, it should be removed, and re-applied; but should it be worn so as not to be likely to last till the hoof grows again, a new defence must be applied.

CIRCUMSTANCES THAT REQUIRE ALTERATION IN THE CONSTRUCTION AND APPLICATION OF THE DEFENCE.

The defence, when necessary, can be hardened and tempered generally or at particular parts, or constructed with removable pieces *.

The expansion of the defence will prevent slipping in a considerable degree : but during the winter season, the defence with the rough surface should be applied, which does not prevent (like other modes of frosting) the natural bearing on the ground. *Pl.* VII.

When the posterior part of the hoof where it is cylindrical is inclined inwards, the defence should also be inclined inwards, or be applied only opposite, where it is conical, and let into the hoof. *Pl.* VIII.

When the depth of the hoof where it is conical is reduced, the bearing surface of the defence opposite must be diminished in proportion, by

* See Goodwin "On Movable Toe-pieces."

removing the iron that would, in this case, project over the lower circumference of the hoof, and applying it to increase the thickness; when the defence will still be curved opposite where the hoof is cylindrical, and should be turned downwards and outwards, so as to leave the same space between it and the hoof opposite, as between the lowermost part of the crust at this part and the ground before the action of the hoof has taken place. It is also necessary to make the nail-holes in proportion nearer to the outer circumference, that the nails may be driven so as to get sufficient hold. The nail-head is then required to be of greater substance in depth.

CONCLUSION.

As much attention should be paid to rear and preserve the hoof as other parts of the animal; but this important object is frequently overlooked till the hoof is deformed or destroyed. The hoof is then obliged to be defended according to the circumstances of the case; and it is expected

that the deformity is to be removed, and further destruction prevented; when it has been fully proved that the methods hitherto adopted for this purpose, so far from doing this, oftener increase the deformity and destruction *: and is often brought to the notice of proprietors, in the vexatious disappointments experienced from the consequent lamenesses in their horses, the cure of which is frequently hopeless; and the use of horses not obtainable, except by the operation of neurotomy (excision of the nerves leading to the foot), which is now the last resource: and, however advantageous in these cases, is at once a confirmation of the necessity of paying more attention to measures that will prevent so often having recourse to it.

Whenever the proportion of the hoof cannot be preserved without, the hoof may be defended upon these principles at any age; and as the animal grows, the size of the defence can be increased, as this system affords immediate facility

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* See B. Clark's Experiments.

of supplying the sizes of shoes and nails, an object of convenience at all times, and of great importance to an army on foreign service.

There is now a standard to guide those deputed to the care of horses in preserving the hoofs, which it will be to the interest of proprietors to have strictly attended to, as every person connected with horses may be in possession of the knowledge of ascertaining readily the state of the hoofs: and though the hoofs may not be so defective in proportion, but that by any method of shoeing the ordinary use of the horse is not prevented, to constitute unsoundness: the horse will nevertheless be depreciated in value to the amount of the expenses likely to be incurred in restoring the hoofs to the original proportion.

Any form of artificial defence for the hoofs of horses and other animals is now made* of malleable metal, which is found to answer the

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* By Messrs. Goodwin and Dudley, the patentees, 36 King Street, Soho, London.

purpose: and when the obstacles to its use, from the present state of the trade, are removed, the condition of the workmen engaged in it will be ameliorated, by their being released from the most laborious part of their employment, which of necessity confines it to men of no education, and prevents improvement in the art, the state of which causes in a great degree the difficulties in the practice; and these will continue while the workmen are unacquainted with the fundamental principles of the art.

The workmen have now a specific plan laid before them; and it would be advantageous to the proprietors of horses to employ men whose qualifications are duly attested by a member of the Veterinary College.

EXPLANATION OF THE PLATES.

PLATE I.

Fig. 1. Perpendicular section of the off fore hoof and defence. *a.* Crust. *b.* Bars. *c.* Sole. *d.* Frog. *e.* Frog-band. *f.* Coronary concavity. *g.* Great cavity of the hoof.

Fig. 2. The inner part of the defence and horizontal line, to show what is taken from the inferior surface by the removal of the conical part; and the curve opposite the cylindrical part before the action of the defence takes place, or it is turned downwards and outwards.

PLATE II.

Fig. 1. Half the convex surface of the hoof unfolded, to show the proportion. *a. b.* The depth of the hoof at the outer and inner part of the front. *c.* The circumference of the upper part of the hoof. *d.* The depth of the hoof at the posterior part, opposite the inflections. *e.* The lowermost

part of the crust. *f. g.* The depth of the hoof at the anterior and posterior parts, when the hoof is pared for the defence. Pasteboard cut twice the size of *fig.* 1. will show the form, bearing, and action of the crust.

Fig. 2. represents half the concave surface of the great cavity of the hoof. Pasteboard cut twice the size, and placed at three degrees less inclination than the front of the hoof, will show the bearing of the inferior circumference of the sensible parts on the inferior surface of the hoof.

PLATE III.

Represents the bearing of the lowermost part of the crust. *a.* Bearing where it is conical, before the action of the hoof. *b.* Where it is cylindrical, not bearing. c. Bearing when the action of the hoof has taken place. *d.* Bearing of the defence. *e.* The curved part not bearing. The action of the defence is dependent on the construction and application: see pp. 30, 32, 33.

PLATE IV.

Geometrical construction of the defence and nails: see page 28.

PLATE V.

Fig. 1. represents the ground surface of a defence in four pieces, having slide joints.

Figs. 2, 3, 4 & 5. The nail.

Fig. 6. Slide joint at the side.

Fig. 7. The two pieces lying over each other on the inner circumference.

PLATE VI.

Fig. 1. represents the front and side slide joints on the outer circumference of the defence.

Fig. 2. The two pieces of the front slide joint lying over each other on the inner circumference.

Fig. 3 & 4. The front slide joint separated to show the segments of the sector, which lie over and support each other in contrary directions.

Fig. 5. The hoof surface of the defence.

PLATE VII.

The off fore hoof, with the coneform on the outer part of the front only, and the defence applied. A circular piece of pasteboard divided a little beyond the centre, and turned upwards, so as to leave a triangular space, which, when contracted,

will show the bearing of the inferior surface of the hoof before the action of it has taken place; and when the pasteboard is depressed at the centre, the action and the bearing when it is completed, according to the kind of surface on which it is placed.

PLATE VIII.

The defence without joints, cut for a hoof, with the coneform on the outer and inner part of the front. *a.* Space between the inflections of the crust, before the action of the hoof. *b. b.* The cylindrical part of the crust, or the defence, to be turned downwards and outwards. *c. c.* Where the defence is cut to let into the hoof, when applied only opposite where the hoof is conical.

THE END.

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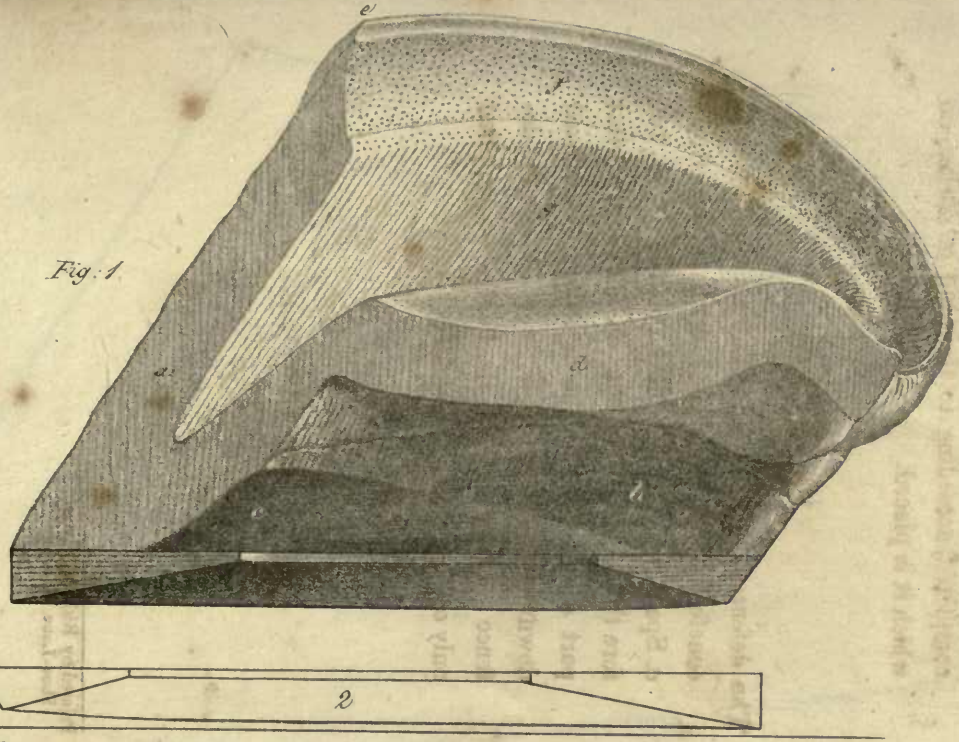

Fig. 1

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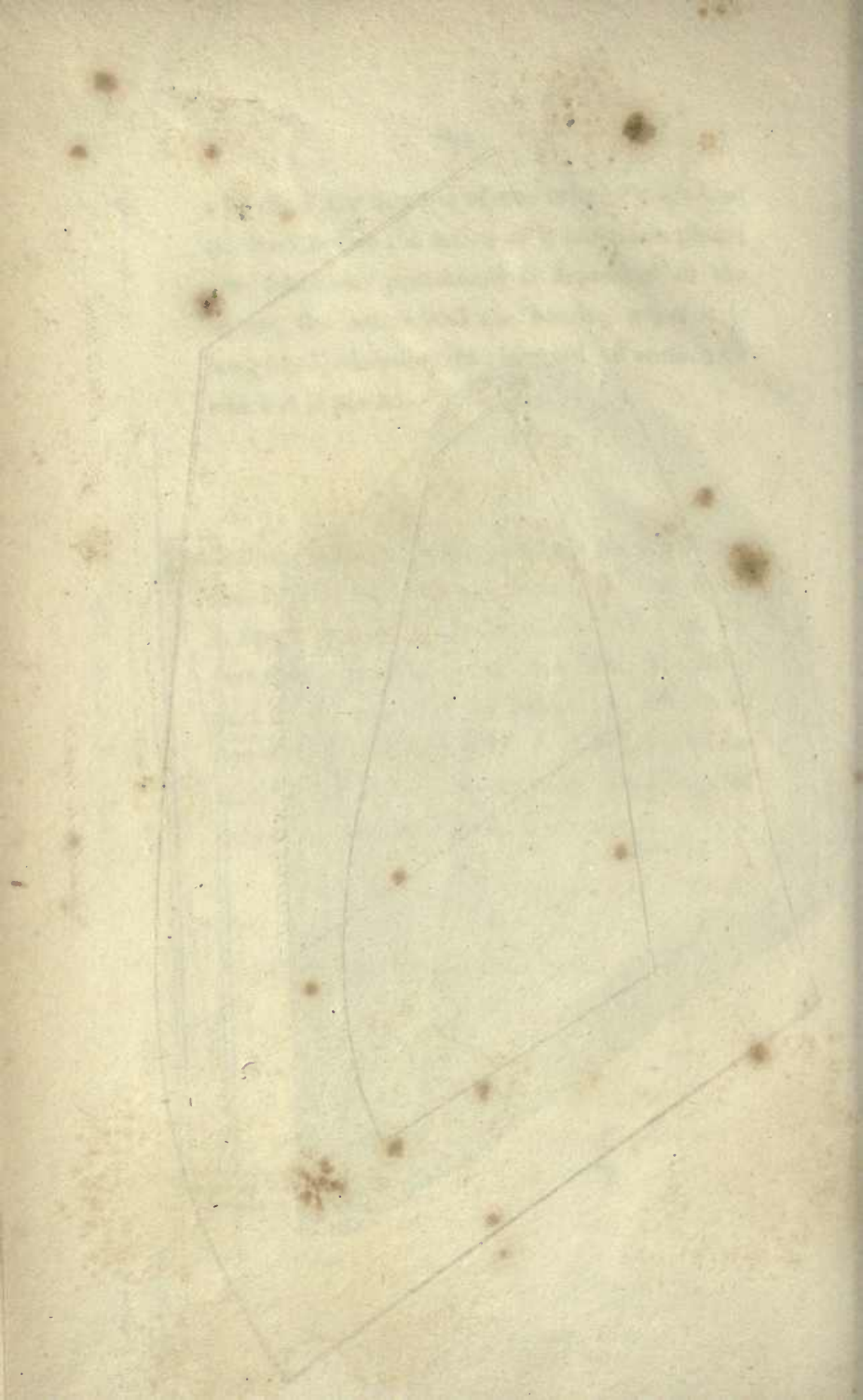

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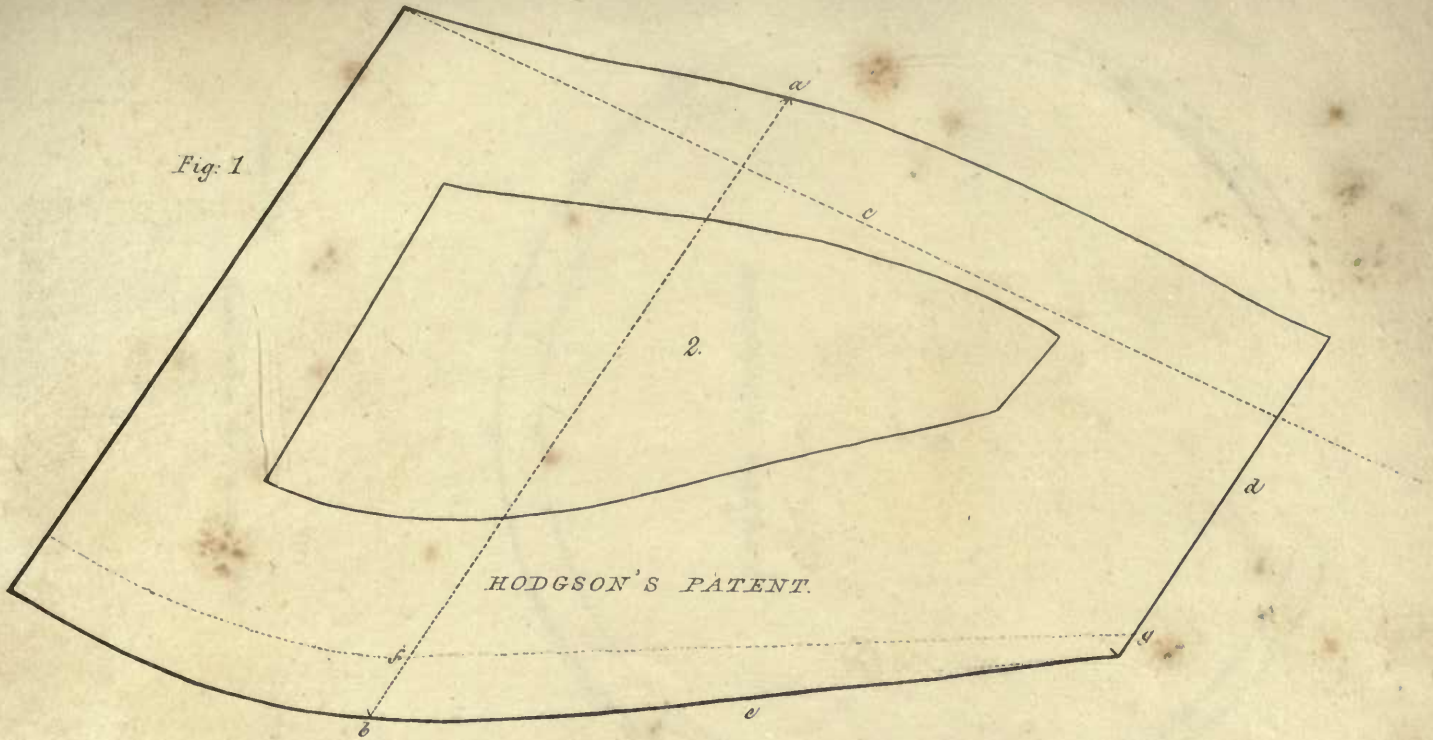

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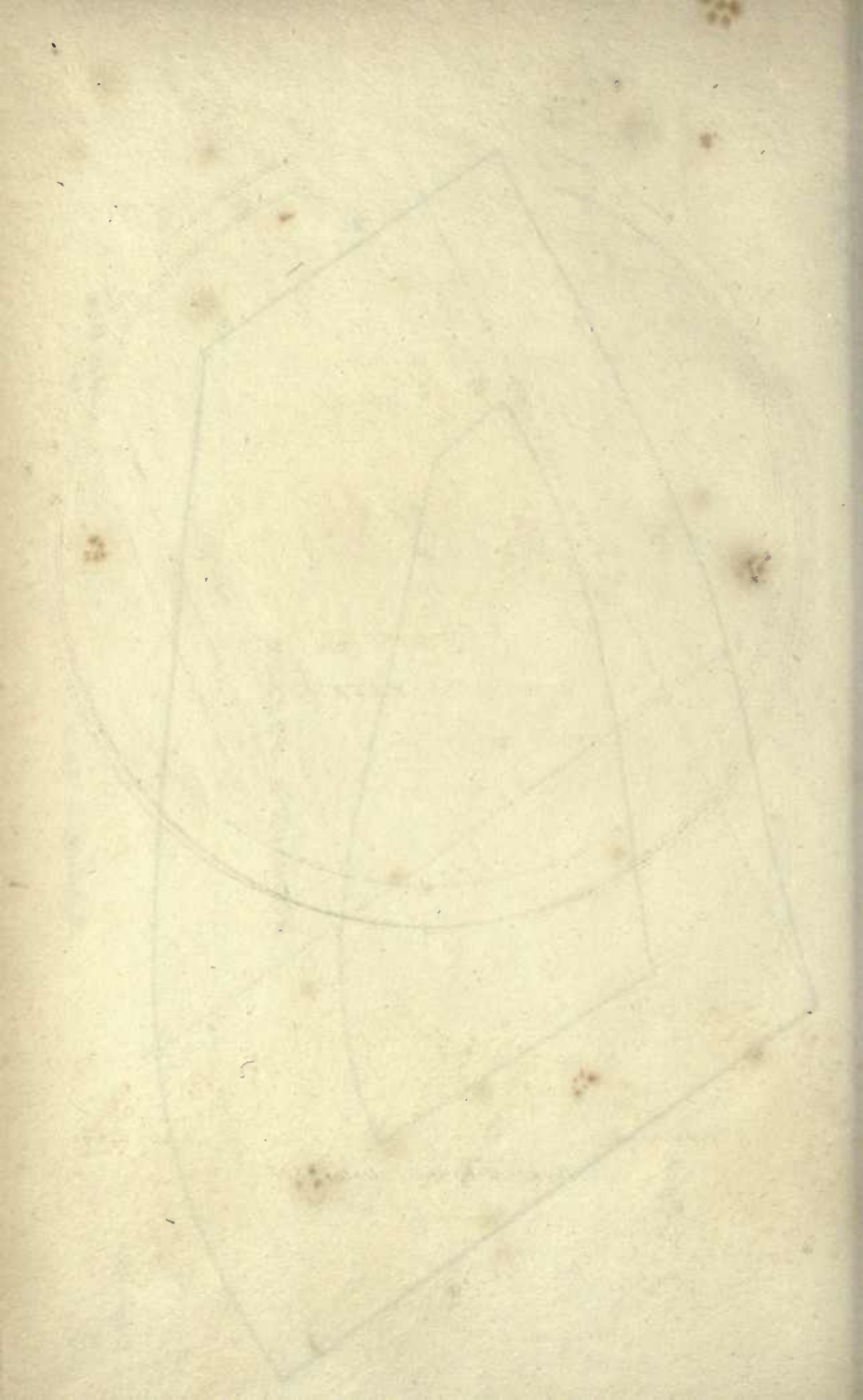

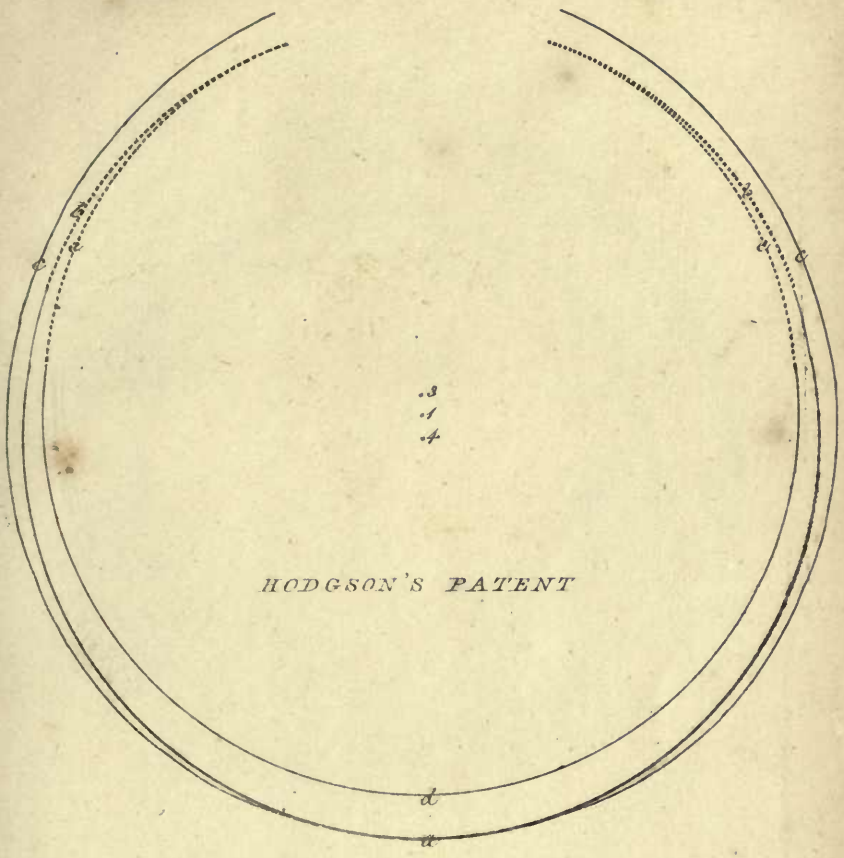

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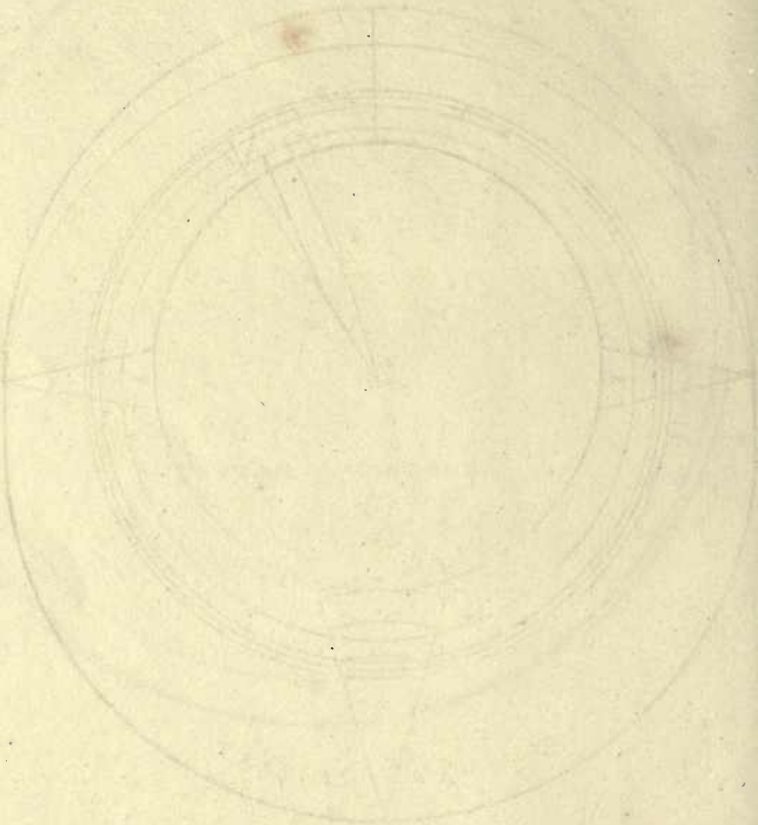

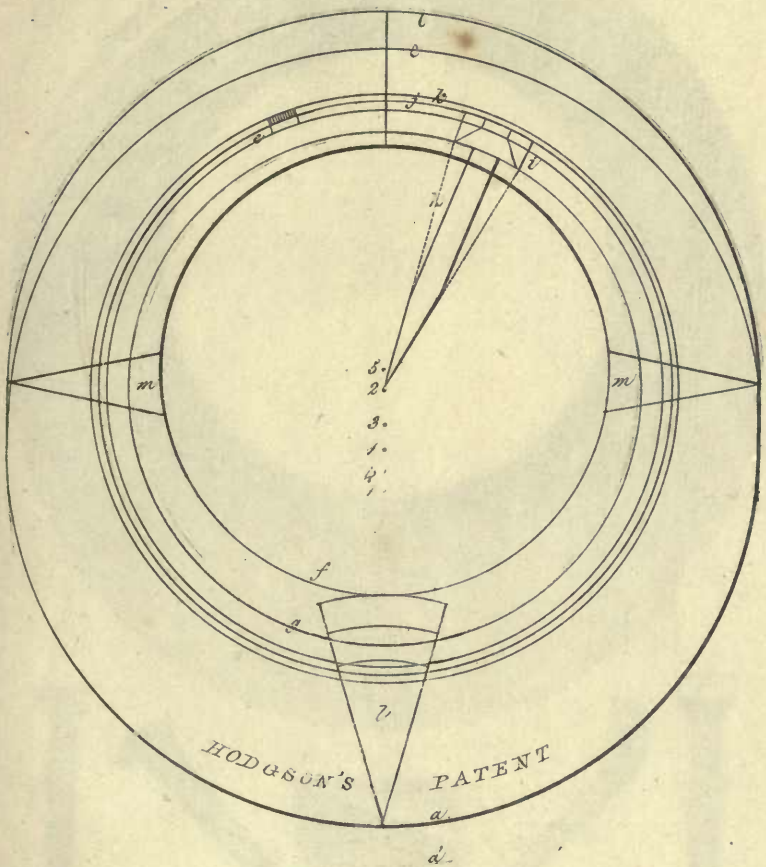

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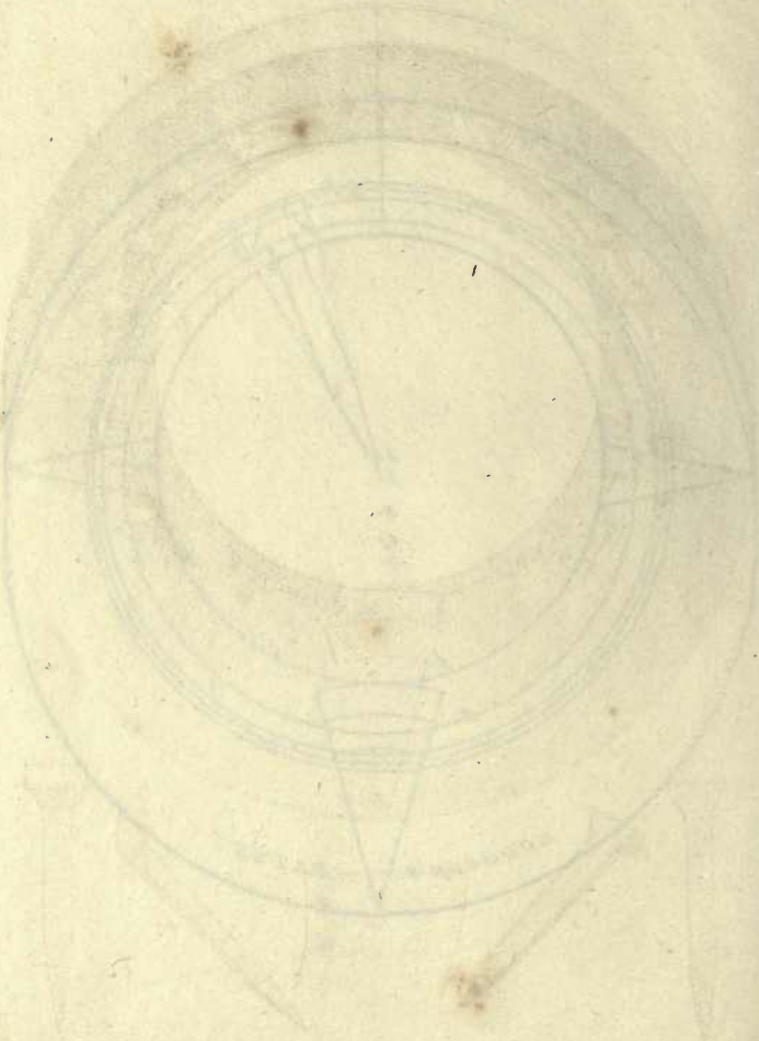

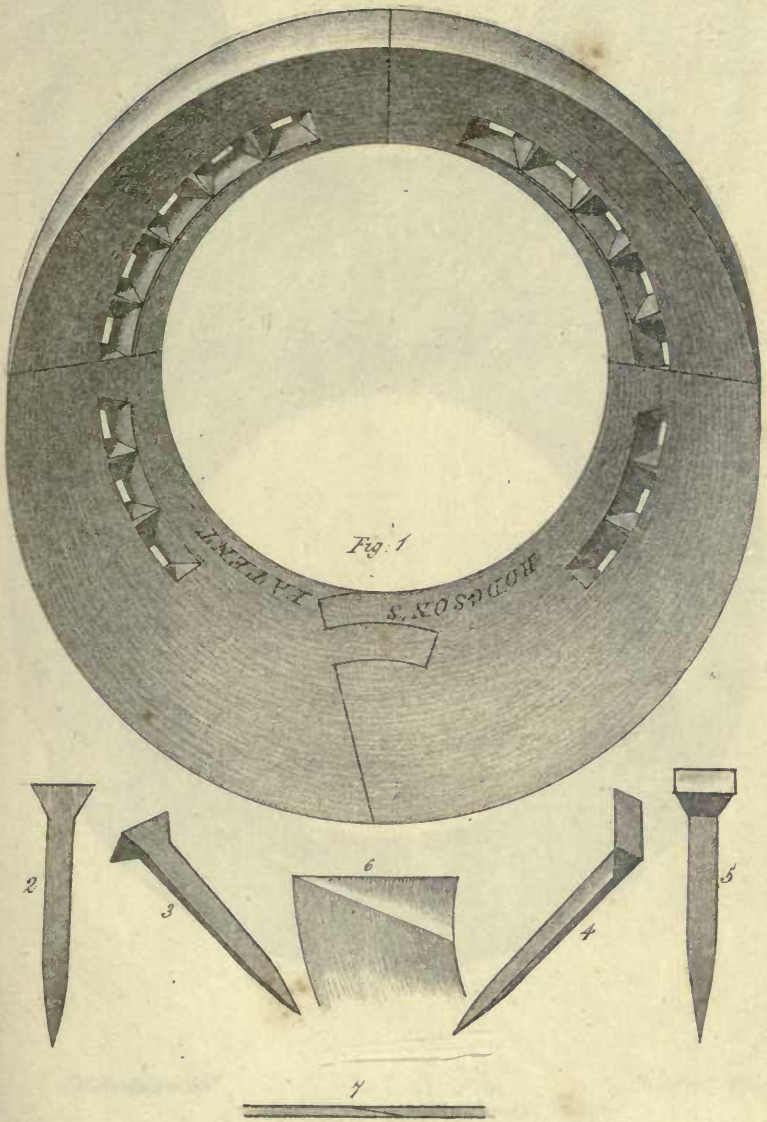

Fig. 1

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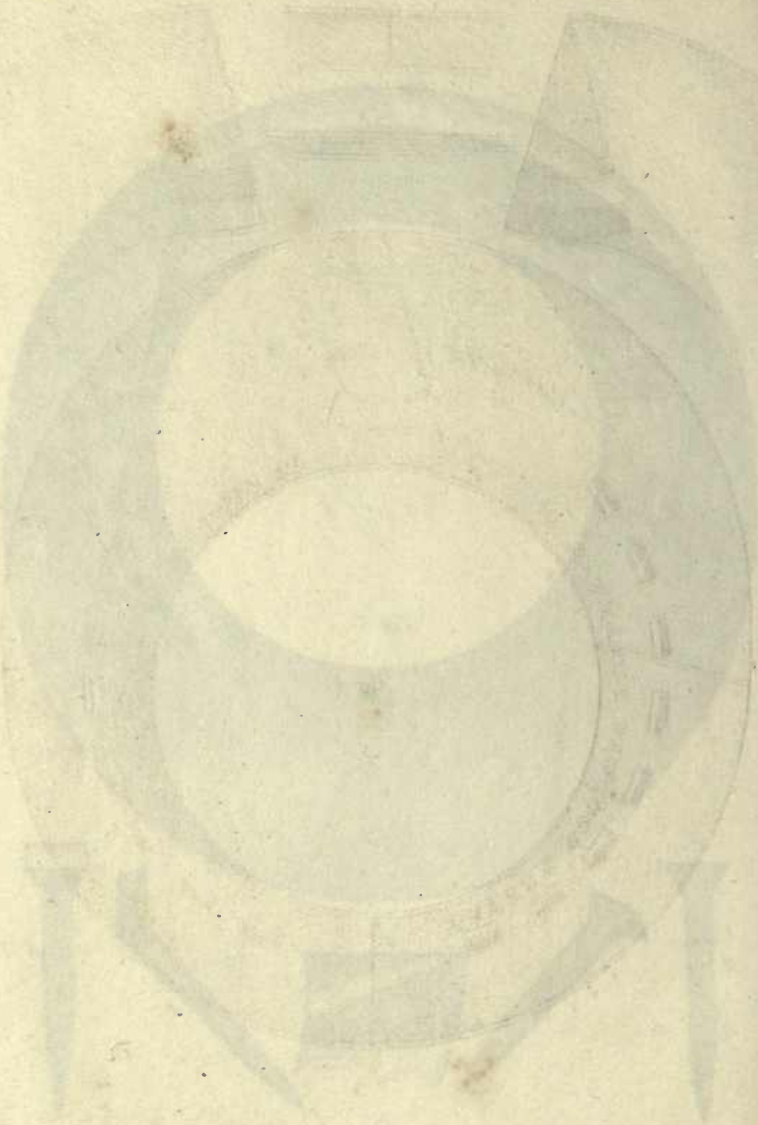

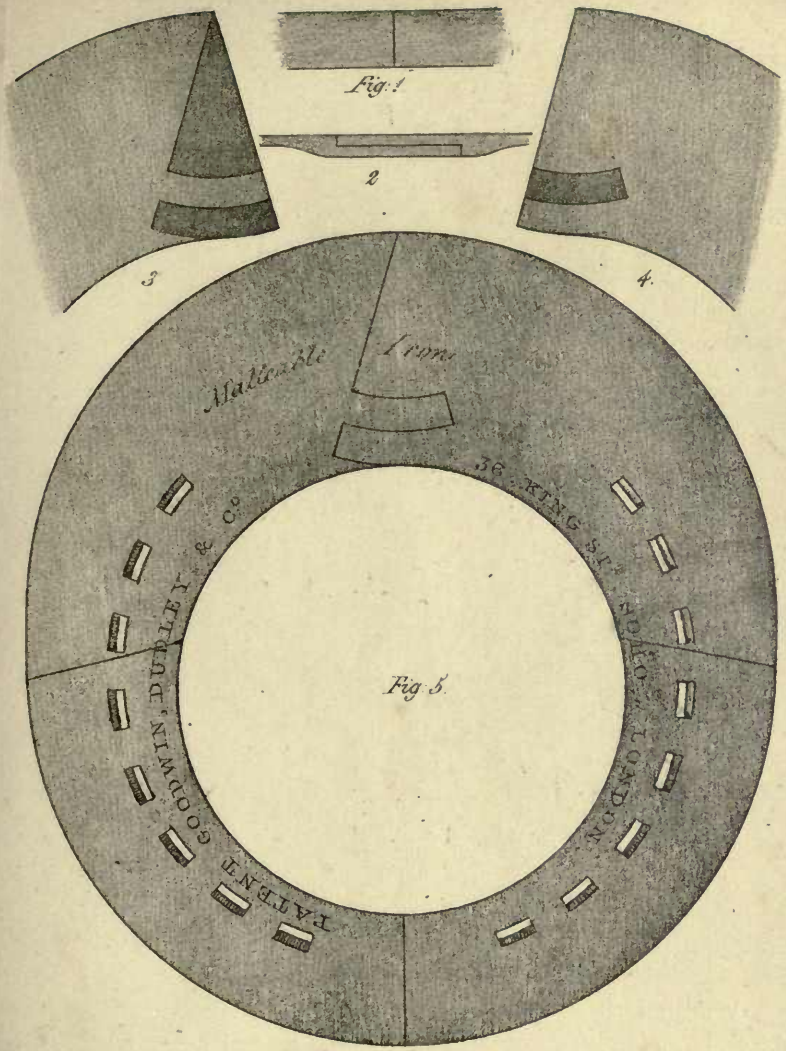

Fig 5.

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G. Scharf lith.g

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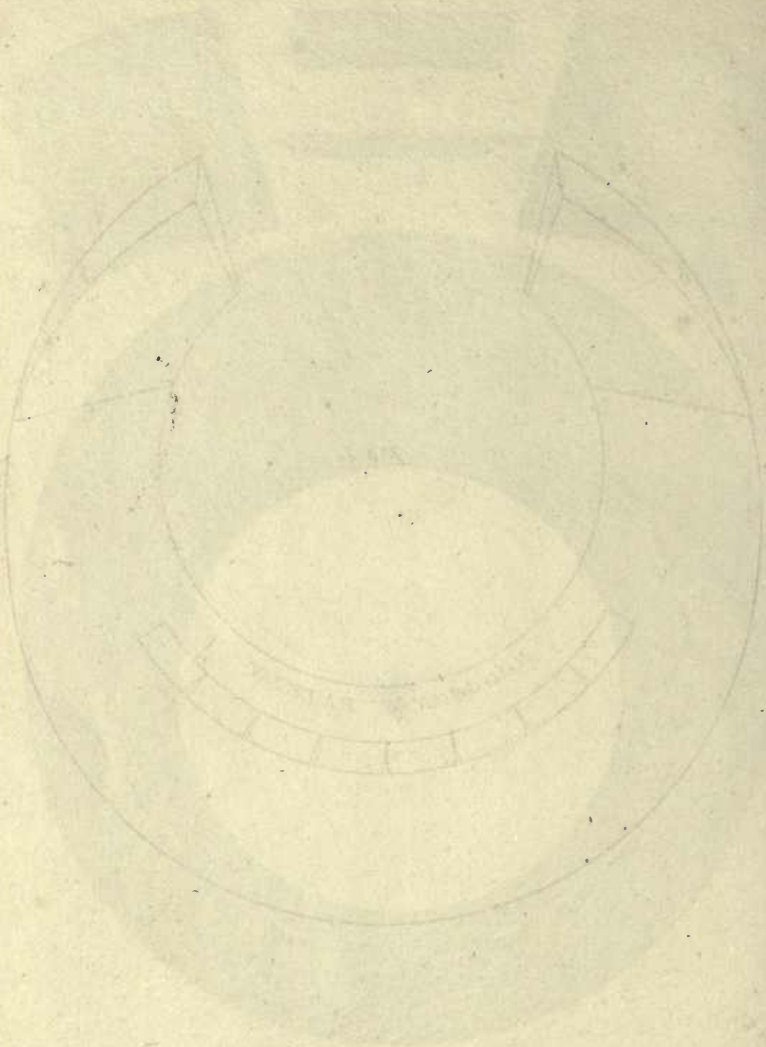

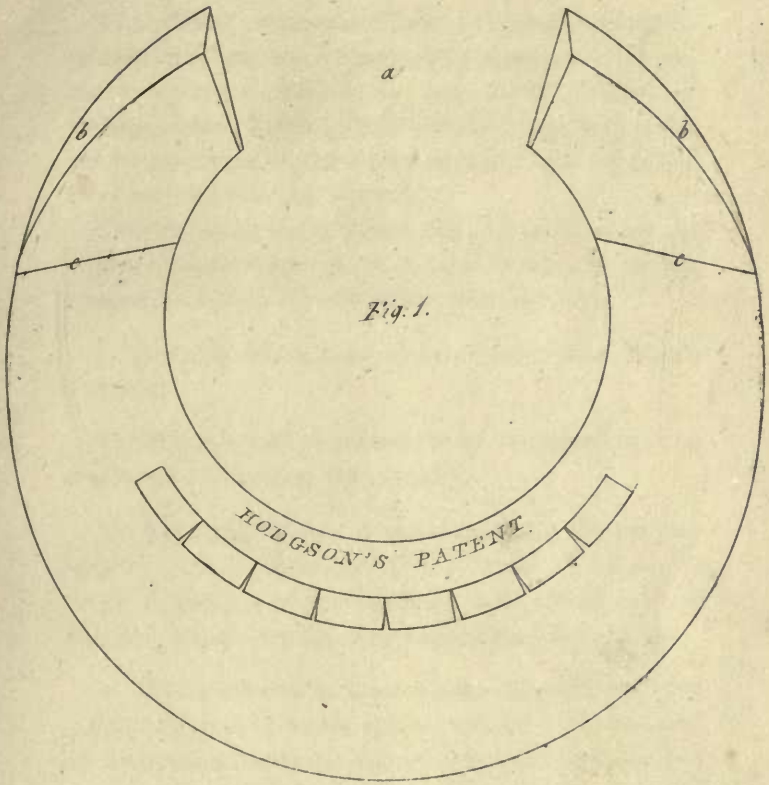

Fig. 1.

I T Hodgson del. C. Scherf Lithog.

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The Patent Malleable Metal Horse-shoes may be altered the same as wrought-iron shoes, at a blood-red heat, but should not be exposed to a white or welding heat. When fitted to the foot, they must not be quenched in the water-trough, but thrown on the floor and allowed to cool.

The malleable metal shoes may, when necessary, be hardened and tempered to a blue colour, or spring temper, at the toe or any other wearing part.

1. Heat the whole shoe all over alike to a blood-red heat.

2. Only the part required to be tempered is to be hardened by dipping it in water.

3. On taking it out of the water, rub the part instantly with a rag-stone or file, until it becomes a little bright; in a few seconds a straw-colour will appear, which shortly afterwards changes to a blue.

4. When arrived at that colour, the tempered part may be dipped in water again, to keep it of the same temper, and afterwards left to cool on the ground gradually. In this state, the part of the shoe tempered is of spring quality; its wearing property consequently is considerably increased.

In a state of preparation for the Press,

BY THE SAME AUTHOR,

OBSERVATIONS ON THE CAUSES, PREVENTION AND CURE OF THE DISEASE IN THE HORSE, CALLED "GLANDERS, FARCY," &c.

Dedicated to EDWARD COLEMAN, Esq., Professor of the Veterinary College, &c.

Mr. HODGSON intends shortly to deliver a Course of Demonstrative Lectures on the Art of Preserving and Defending the Foot of the Horse, &c.


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